Idaho Department of Fish and Game

Dworshak Reservoir Quarterly Report

Eric Stark, Sr. Fishery Research Biologist
Ric Downing, Sr. Fishery Technician
Josh Goodwin, Research Data Tech

Illustration by J.R. Tomelleri

July, August, September 2004

Inside this issue:

Figure 1. Dworshak Reservoir near full pool near Big Eddy Marina, 2004.

Points of Interest:

- Total population estimate of 4.3 million kokanee.
- Density of adult (age 2) kokanee decreased from 17 to only 6 fish/ acre since 2003.
- Kokanee average size larger than in 2003, with further decrease in density of adult fish.
- Number of adult spawners at 8,466; down nearly 1/3 from 2003.
- Design and placement of installed transducer scheduled for December.
- Kokanee densities near dam much higher than last year, concurrent with increased overall reservoir abundance and density.

Kokanee Population Estimate

Reservoir-wide mid-water trawling was conducted to estimate kokanee abundance in Dworshak, on the evenings of July 12th, 13th, and 14th. Fish from each trawl sample were counted and total length (TL) and weight of individual kokanee was measured. Scales were also taken from 10 fish in each 10 mm size interval to verify kokanee ages. Fish numbers per transect (haul) were divided by transect volume for age-specific density estimates. The total number of kokanee for each stratum and reservoir total were calculated using standard expansion formulas for stratified sampling designs (Scheaffer et al. 1979).

A total of 1297 kokanee were captured during mid-water trawls, with the largest measuring 333 mm (13.1in) and smallest measuring 27 mm (1.1 in). Aging of trawl-caught kokanee revealed fish from 3 age classes: age 0, age 1, and age 2; however, there was no age-3+ kokanee present in the catch (Figure 2). Age-0+ kokanee ranged from 27-81 mm TL (1.1 – 3.2 in),age-1+ fish ranged from 100 to 250 mm TL (3.9 – 9.8 in), and age-2+ kokanee ranged from 250 to 333 mm TL (9.8 – 13.1 in) (Table 1; Figure 2).

We estimated a total abundance of approximately 4.3 million kokanee in Dworshak Reservoir, during the July 2004 trawl survey; 3,136,892 age-0, 692,348 age-1, and 90,715 age-2 (Figure 3).

Using this preliminary data, decreasing population abundance estimates indicate kokanee have incurred high entrainment losses over the last year. However, this year we may have also had fairly high fishing exploitation contributing to the decreased overall abundance, especially of age 2+ fish by July, when the survey was conducted.

Age 2+ kokanee incurred over 50% declines in abundance since last year, yet age 0+ abundance is nearly 10 times last years age 0+ abundance. We would expect no less than 50% annual survival rates for a population with little or no predation. Obviously our Dworshak ko-

Trawl Kokanee Catch				
	Age 0	Age 1	Age 2	Total
#	1060	181	56	1297
%	81.73	13.96	4.32	

Figure 2. Length frequency of kokanee from mid-water trawling in Dworshak Reservoir, July 12-14, 2004.

(Continued from page 1)

kanee survival specifically for age 2+ fish is much poorer than this, which suggests additional mortality than simply natural mortality alone. It appears evident entrainment losses continue to reduce annual kokanee survival and contribute to continued annual population fluctuations and instability (Figure 4).

Average size of age 2 kokanee was substantially larger this year (294 mm, 11.6 in) than last year when the mean total length was about 259 mm (10.2 in). We did not conduct angler checks to obtain age-at-length data, but instead conducted trawling again this year to obtain this data.

Figure 5. The Almar™ Trawler', 31 foot research vessel.

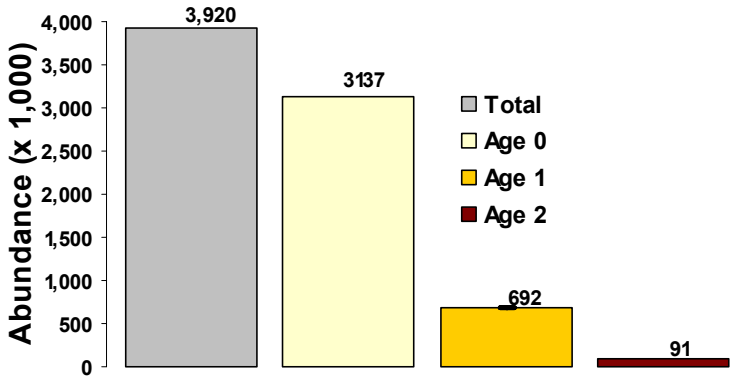

Figure 3. Total, age-0, age-1, and age-2 kokanee abundance in Dworshak Reservoir, obtained from trawl sampling, July 12-14, 2004.

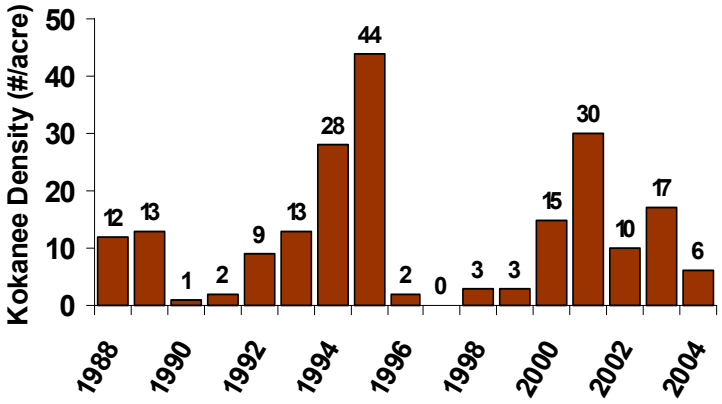

Figure 4. Density of catchable-sized (age-2) kokanee in Dwor-

Spawner Counts

Figure 6. Adult kokanee staging for spawning in Isabella Creek, during September survey.

We conducted our annual tributary stream spawner counts on September 22nd and 23rd this year. Kokanee were counted in four tributaries to the North Fork Clearwater River upstream of Dworshak Reservoir; which serve as an additional relative index of the adult kokanee abundance. We walked these streams from their mouths to the furthest upstream reaches utilized by kokanee.

We counted a total of 8,466 spawning kokanee in our three index streams, which was nearly one third of last years total of 23,612 fish. Spawning kokanee averaged 308 mm in total length.

Counts closely match what we expected for the index tributaries based upon the 2004 population estimate. Abnormally high water made this year's survey more difficult and time consuming; however, water clarity did not hamper our ability to count adult kokanee. Although more tributary length appeared to have been accessible due to the high water, kokanee did not appear to travel farther upstream to utilize these areas (Figure 6).

Entrainment monitoring equipment: preliminary installation plans

As previously discussed in several quarterly reports, we have found that our entrainment sampling could be dramatically improved by permanently installing hydroacoustic transducers inside the dam. Fixed transducers placed much closer to the actual penstock openings of each turbine would help ensure all fish targets detected with the echosounder are truly entrained and do not have the ability to change course and avoid entrainment after leaving the downstream edge of the acoustic beam.

This quarter we continued our efforts towards installing transducers inside the structure of the dam. In August we met with a hydroacoustics expert and toured the dam and investigated where and how we could install transducers. We were able to find a location and elevation which would give us the best acoustic coverage to detect fish without interference from the concrete walls or trashracks of the turbine unit.

We agreed upon attaching transducers inside the hollow chambers between the penstock openings and the selector gates of each turbine (Figure 7). We also were able to find safe locations to run the transducer cable, which connects the transducer with the echosounder, as well as a location for the sounder itself. Lastly, we determined it should also be feasible to use a wireless ethernet system to send acoustic signal data collected by the echosounder to a data collection computer over a mile away at our Ahsahka field office.

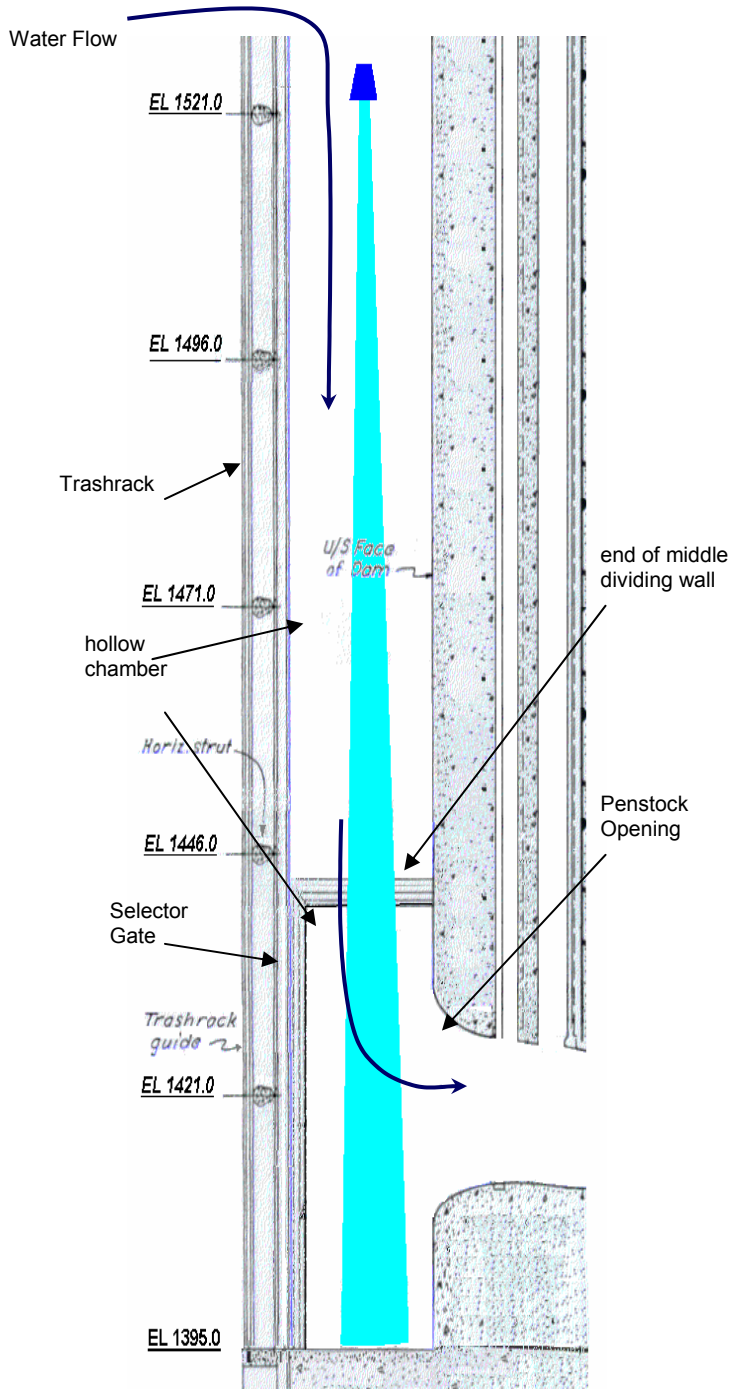

Figure 7. Sectional view of the hydroacoustic sample area inside the concrete chamber immediately upstream of the turbine 2 penstock opening.

Kokanee Densities near the Dam

We continued monthly hydroacoustic surveys within the forebay area of the reservoir (near the dam) again this quarter. These quick surveys are done to determine the time of the year most critical for kokanee entrainment losses as well as determine when kokanee densities are high enough to feasibly test the effectiveness of underwater strobe lights to reduce kokanee entrainment.

Fish densities near the dam this summer were substantially higher than last year during July, August, and September (Figure 8). August densities increased to 146 fish/acre, more than 5 times higher than last August. September kokanee densities reached 165 fish/acre, substantially higher than 2003, which was when our reservoir-wide average density and total abundance reached it's highest numbers.

Densities near the dam are higher than previous years, which corresponds to the increased overall reservoir-wide abundance and density. So, despite higher densities near the dam this year, we don't believe this means that fish are concentrating more in the lower reservoir than in previous years.

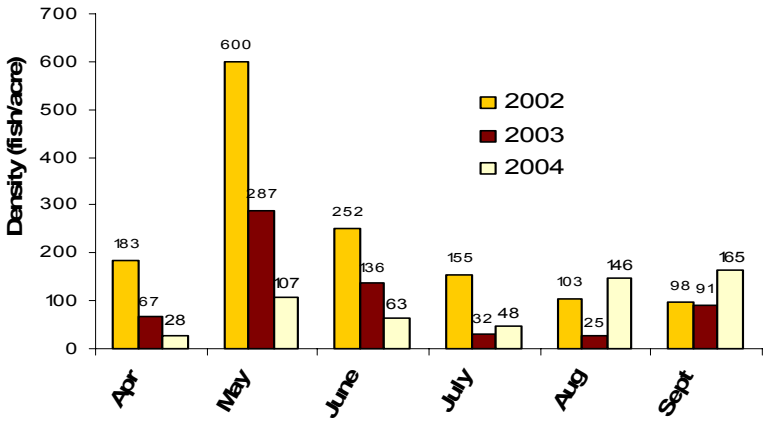

Figure 8. Comparison of mean monthly kokanee density (fish/acre) in the forebay area of Dworshak Reservoir between years, April through September.

Figure 9. Dworshak Reservoir forebay area, Dam, spillbay, and North Fork Clearwater River below the Dam.

Next Quarter's Activities

During the next quarter, we will continue entrainment and forebay density surveys. We will finish writing the 2003 annual report and continue analysis and interpretation of entrainment echograms.

We will also be preparing a recommendation plan to permanently install underwater strobe lights as a measure to reduce fish entrainment through Dworshak Dam. This plan will be submitted to the U.S. Army Corps of Engineers, whom we're hoping will find funds and resources to implement this technology that was shown to be an effective deterrent to fish.

Lastly, we be installing a hydroacoustic transducer inside turbine unit #2 as well as setting up of a wireless ethernet system to transmit the acoustic data to our office for analysis.

Internet Links to more info:

Are you looking for past quarterly and annual reports concerning Dworshak Reservoir research?

They can be found on Idaho Fish and Game's website at (**http://fishandgame.idaho.gov./tech/reports/**). Click on the **Fisheries** link, type '**Dworshak**' into the space to the right of the magnifying glass on the upper right of the screen, and click on the green 'Go' button.

Questions and comments on Dworshak Quarterly reports should be addressed to:

Dworshak Research Project
c/o Eric Stark
P.O. Box 56
Ahsahka, Idaho 83520
(208) 476-9244
estark@idfg.state.id.us

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